

Notice of Allowability

Application No.

10/780,405

Examiner

Ali Imam

Applicant(s)

WENG ET AL.

Art Unit

3737

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 8/22/5.
2. ☒ The allowed claim(s) is/are 22-49.
3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) ☐ All b) ☐ Some* c) ☐ None of the:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).


* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
 5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
 - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
 - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
 - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____
7. ☒ Examiner's Amendment/Comment
8. ☐ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.


Ali Imam
Primary Examiner
Art Unit: 3737

EXAMINER'S AMENDMENT

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

The application has been amended as follows in order to conform to proper claim numbering:

The previous version of claims filed 02/17/2004 has been replaced with the following:

-- Claims 1-21 (canceled).

22. A method for selectively employing an ultrasound transducer for ultrasound imaging and for administering ultrasound therapy, comprising the steps of:

(a) selectively energizing the ultrasound transducer in one of an imaging mode and a therapy mode;

(b) while energizing the ultrasound transducer in the imaging mode, selectively reducing a quality factor associated with the ultrasound transducer; and

(c) while energizing the ultrasound transducer in the therapy mode, enabling a substantially greater quality factor to be associated with the ultrasound transducer, than when operating in the imaging mode.

23. The method of Claim 22, wherein the step of selectively reducing the quality factor comprises the step of actuating a switch that causes a resistance to be coupled in parallel with the ultrasound transducer.

24. The method of Claim 22, wherein the step of selectively reducing the quality factor comprises

Art Unit: 3737

the step of coupling the ultrasound transducer to an imaging damping network, while the step of enabling the substantially higher quality factor comprises the step of coupling a therapy damping network to the ultrasound transducer.

25. The method of Claim 22, further comprising the step of repeating steps (a) - (c) together for each of a plurality of ultrasound transducer elements comprising an ultrasound applicator, while the ultrasound applicator is inserted inside a patient's body to successively image and administer ultrasound therapy to an internal site within the patient's body.

26. The method of Claim 25 further comprising the step of interrupting administration of ultrasound therapy in order to image the internal site to determine a status of the internal site and to evaluate a progress of the ultrasound therapy.

27. A flexible ultrasound transducer comprising:

- (a) a thermally and electrically conductive layer,
- (b) a plurality of ultrasound transducer elements supported by the thermally and electrically conductive layer, in a spaced-apart array, adjacent ultrasound transducer elements in the array being separated by a kerf that is filled with a deformable material that readily expands and contracts without being damaged during bending of the array;
- (c) an outer impedance matching layer disposed over an outer surface of the thermally and electrically conductive layer; and
- (d) a plurality of electrodes disposed on an opposite end of each of the plurality of ultrasound transducer elements from that supported by the thermally and electrically conductive layer, said plurality of ultrasound transducer elements being energized by a signal applied between the plurality of electrodes and the thermally and electrically conductive layer, said flexible ultrasound

transducer being bendable to a desired radius of curvature to achieve a desired focal point for the flexible transducer.

28. The flexible ultrasound transducer of Claim 27 , further comprising a housing in which the flexible array is mounted.

29. The flexible ultrasound transducer of Claim 27, wherein each of the plurality of ultrasound transducer elements comprises a composite mixture that includes a piezo-ceramic, an adhesive binder, and thermally conductive particles.

30. The flexible ultrasound transducer of Claim 27, further comprising a movable shaft attached to one end of the array, said movable shaft being movable to change a spacing between opposite ends of the array and thereby to achieve the desired radius of curvature, and thereby to achieve the desired focal point.

31. The flexible ultrasound transducer of Claim 30 further comprising a prime mover that is coupled to drivingly move the shaft when the prime mover is selectively energized, said prime mover being energized to move the movable shaft to achieve the desired radius of curvature and the desired focal point.

32. The flexible ultrasound transducer of Claim 27 further comprising a carriage on which the array is supported, said carriage being movable to control a direction in which an ultrasound beam emitted by the plurality of ultrasound transducer elements is directed.

33. The flexible ultrasound transducer of Claim 32, wherein the carriage is coupled to a movable shaft that is moved to move the carriage.

34. The flexible ultrasound transducer of Claim 33, wherein the shaft is coupled to a prime mover that is selectively energized to move the carriage, and thereby, to move the array.

35. The flexible ultrasound transducer of Claim 33, wherein the carriage is translatable along a longitudinal axis of the carriage to move the array longitudinally.

36. The flexible ultrasound transducer of Claim 27, further comprising a solenoid and a support rod coupled to the array and selectively actuated by said solenoid to achieve the desired radius of curvature and the desired focal point for the array by changing a spacing between opposite ends of the array.

37. The flexible ultrasound transducer of Claim 27, further comprising a movable link attached to the array, said movable link being movable to change a curvature shape and orientation of the array and thereby to steer an ultrasound beam emitted by the array in a desired direction.

38. The flexible ultrasound transducer of Claim 27, further comprising a limit stop that abuts against a back of the array to control a curvature shape of the array.

39. The flexible ultrasound transducer of Claim 27 further comprising a plurality of pins that act against a back of the array to define a curvature shape of the array.

40. The flexible ultrasound transducer of Claim 39, wherein the pins are movable to vary the curvature shape of the array and thus, to control a focus point of the array.

41. The flexible ultrasound transducer of Claim 40, further comprising a key having a plurality of surfaces that act upon the plurality of pins to define the curvature of the array and thus, the focal point of the array.

42. The flexible ultrasound transducer of Claim 41, wherein the plurality of surfaces of the key are cam shaped and wherein the key is adapted to vary the position of the pins and thereby, to vary the focus of the array as the key is moved.

43. A method for selectively controlling at least one of a direction in which an ultrasound beam is emitted by an ultrasound transducer and a focus point of the ultrasound transducer, comprising the steps

Art Unit: 3737

of:

- (a) providing a flexible transducer array that includes a plurality of ultrasound transducer elements supported on a flexible layer;
- (b) energizing the plurality of ultrasound transducer elements so that they emit an ultrasound beam; and
- (c) enabling a user to selectively cause the flexible transducer array to bend so that the flexible transducer array assumes a curvature that achieves at least one of a desired direction and a desired focal point for the ultrasound beam emitted by the plurality of ultrasound transducer elements.

44. An ultrasound transducer that emits an ultrasound beam in at least one of a desired direction and at a desired focal point, comprising:

- (a) a plurality of separate ultrasound transducer elements that are pivotally mounted in a spaced-apart array; and
- (b) a plurality of actuators coupled to the plurality of ultrasound transducer elements and adapted to selectively rotate the plurality of separate ultrasound transducer elements about an axis of each, thereby orienting each of the plurality of separate ultrasound transducer element so that it is directed in a desired direction, and so that when energized, the plurality of separate ultrasound transducer elements collectively emit an ultrasound beam in at least one of a desired direction and a desired focal point.

45. The ultrasound transducer of Claim 44, wherein each of the plurality of actuators includes a prime mover and a linkage coupled to one of the plurality of separate ultrasound transducer elements.

46. The ultrasound transducer of Claim 44, further comprising a housing in which the plurality of separate ultrasound transducer elements are disposed.

47. The ultrasound transducer of Claim 44, further comprising a plurality of leads separately

Art Unit: 3737

coupled to each of the plurality of separate ultrasound transducer elements to provide a driving signal thereto.

48. The ultrasound transducer of Claim 44, wherein each of the plurality of separate ultrasound transducer elements comprises a composite mixture that includes a piezo ceramic, an adhesive binder, and thermally conductive particles.

49. A method of mechanically controlling at least one of a desired direction and at a desired focal point of an ultrasound beam emitted by a plurality of separate ultrasound transducer elements, comprising the steps of:

- (a) providing a plurality of separate ultrasound transducer elements that are pivotally mounted to rotate when actuated by a linkage;
- (b) actuating the plurality of separate ultrasound transducer elements so that each emit an ultrasound signal; and
- (c) selectively rotating the plurality of separate ultrasound transducer elements about their respective axes so that the ultrasound signals they produce are combined in an ultrasound beam that is directed in at least one of a desired direction and at a desired focus.

Claims 50-60 (canceled). --.

2. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ali Imam whose telephone number is 571-272-4737. The examiner can normally be reached on Mon. - Th., 8:00- 6:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Brian Casler can be reached on 571-272-4956. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Ali Imam
Primary Examiner
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10/17/5